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JANUARY 1992

Ontario
Environment
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ISBN 0-7729-9133-2

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Report prepared by:

Air Resources Branch
Ontario Ministry of the Environment

JANUARY 1992

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PIBS 1769

Phytotoxicology Assessment Surveys in the Vicinity of the Brampton Brick Ltd. Brickworks at 225 Wanless Drive and 514 Main St., N., Brampton - 1990

Background

The new production facility of Brampton Brick at 225 Wanless Drive, Brampton (near Snelgrove), was opened in 1988. The plant did not become fully operational until the old brickworks at 514 Main St., N., Brampton, was shut down in 1989. At this time, all operations were subsequently transferred to 225 Wanless Drive. Phytotoxicology staff conducted a pre-operational vegetation assessment survey in the vicinity of the new brickworks in 1987, as well as post-operational (fluoride) surveys in 1989 and 1990. The final vegetation/fluoride survey around the old brickworks (514 Main St., N) was conducted in 1990. Both surveys were requested by the MOE Central Region. The results of earlier surveys have been previously reported (MOE Report ARB-119-90-Phyto).

Sampling and Inspections

On August 14, 1990, grass was collected at the six sites which were previously sampled in the vicinity of the new brickworks (in November 1987 and October 1989) (see figure). For comparison purposes, these sites were also sampled in mid-September, closer to the time of the grass collection in previous years. In August 1990, unlike previous years, foliage was collected from the exposed side of maple trees at seven sites in the vicinity of the new brickworks (see figure). Four of these were co-located with grass sample sites. The maple and other vegetation growing in the survey area were inspected for foliar fluoride injury.

Also, in August 1990, the regular foliage collection program around the former brickworks in Brampton was repeated (see figure).

In both survey areas, duplicate samples from each site were collected using standard sampling procedures.

The samples were returned to the Phytotoxicology Section Processing Laboratory. Here, the samples were oven dried, ground and stored in glass jars. They were then submitted to the MOE Laboratory Services Branch for analysis of fluoride.

Observations - Area of New Brickwork

Fluoride-type foliar injury of light severity was observed on St. John's Wort plants which were growing between Sites 1 and 2 in the vicinity of the railroad immediately west of the new brickwork. Inspections elsewhere in the survey area did not reveal any foliar injury considered to be attributable to fluoride emissions.

Analytical Results

Attached Table 1 shows the analytical results for the grass/maple foliage collections in the vicinity of the new brickwork. The data are compared with the Upper Limit of Normal (ULN) values established by the Phytotoxicology Section. In September 1990, fluoride concentrations at all grass sites in the vicinity of the new brickwork (Wanless Dr.) were elevated above both the August levels and the corresponding 1987 pre-operational results. The highest levels, which were detected at grass Sites 2 (20 ppm) and 4 (19 ppm) to the immediate south and north of the company, slightly exceeded the 12 ppm rural ULN guideline. However, these levels were well below the level of concern with respect to the health of grazing animals. The results for the August grass collection, except at Site 2,

were comparable to pre-operational levels. In August, only Site 2 (12 ppm) came close to exceeding the rural ULN (12 ppm). The rural ULN was used as no urban ULN has been established for fluoride in grass and, as this area, while being developed for commercial and industrial land use, was recently rural. Farming is still being carried out to the north and west of the brickwork.

Table 1 also shows the fluoride levels which were detected at all maple foliage sites in August 1990. As with grass, the highest fluoride concentrations in maple foliage were detected at Site 2 (73 ppm), to the immediate south of the new brickworks. The table shows that fluoride concentrations also were elevated above the rural ULN (15 ppm) at nearby maple Sites 1, 5 and 6 (see figure). However, similar to the grass results, the elevation above the rural ULN, in most cases, was only marginal. Maple Site 2, with 73 ppm fluoride, was the only site to exceed the urban ULN (35 ppm).

The grass and maple foliage results show that the new Brampton Brick facility is an emission source of fluoride. However, the analytical results and observations to date indicate that the new brickwork is a minor source of fluoride emissions.

Maple Foliage Collection Around Former Brickwork

The August 1990 results for the regular maple foliage survey around the old brickwork (514 Main St., Brampton) are presented in Table 2. The table shows that, since the closure of the plant in 1989, concentrations of fluoride at all sites have declined to within a normal range, as would be expected. In 1990, Site 8 (14 ppm) had a slightly higher fluoride level than the other sites (2-6 ppm) likely because of it's close proximity to the dusty entrance driveway to the plant site.

Summary

In summary, the results of the Phytotoxicology surveys (1987, 1989 & 1990) show that fluoride levels have increased in vegetation in the vicinity of Brampton Bricks's new brickwork (225 Wanless Dr., Brampton), since the plant became operational in 1989. While some vegetation sites were found in 1989 and 1990 to exceed the ULN guidelines, the fluoride elevation above the ULNs was marginal in most cases. Vegetation injury of light severity was observed only in the area of the company's west boundary, and only on one of the most sensitive indigenous plant species, a further indication that the new brickwork is a minor emission source of fluoride.

The 1990 survey around Brampton Brick's former brickwork (514 Main St., N, Brampton), which closed in 1989, revealed that fluoride levels in tree foliage in the vicinity of the plant site have declined to within a normal urban range.

Literature Cited:

MOE Report ARB-119-90-Phyto: Phytotoxicology Section Investigations in the Vicinity of Brampton Brick Ltd., 514 Main St. N., Brampton, 1989 and Brampton Brick Ltd., 225 Wanless Dr., Brampton, 1987 and 1989.

Table 1: Fluoride Concentrations Detected in Vegetation in the Vicinity of Brampton Brick Ltd., 225 Wanless Dr., Brampton - 1987, 1989 & 1990

Site No.	Average Concentration* (ppm, dry wt.) 1987 Nov. 4 (Pre-operational)	1989 Oct. 24	1990 Aug. 14	1990 Sept. 12
		Grass Samples		
1	6	10	5	12
2	5	11	12	20
3	6	11	2	5
4	5	19	5	19
5	6	12	7	9
6	NS	15	5	8
Rural ULN		12		
		Maple Foliage Samples**		
	Species			
1	Silver Maple		20	
2	Silver Maple		73	
5	Silver Maple		21	
6	Manitoba Maple		19	
7	Silver Maple		7	
8	Silver Maple		5	
9	Sugar Maple		4	
Rural ULN			15	
Urban ULN			35	

* Average of duplicate sample results

** Maple sites were sampled for the first time in August 1990

Note: Results underlined exceed rural and/or urban guidelines, see attached appendix

Table 2: Fluoride Concentrations Detected in Tree Foliage in the Vicinity of Brampton Brick Ltd., 514 Main St. N, Brampton, on August 14, 1990 Compared to More Recent Previous Years (1986-1989) September Results.

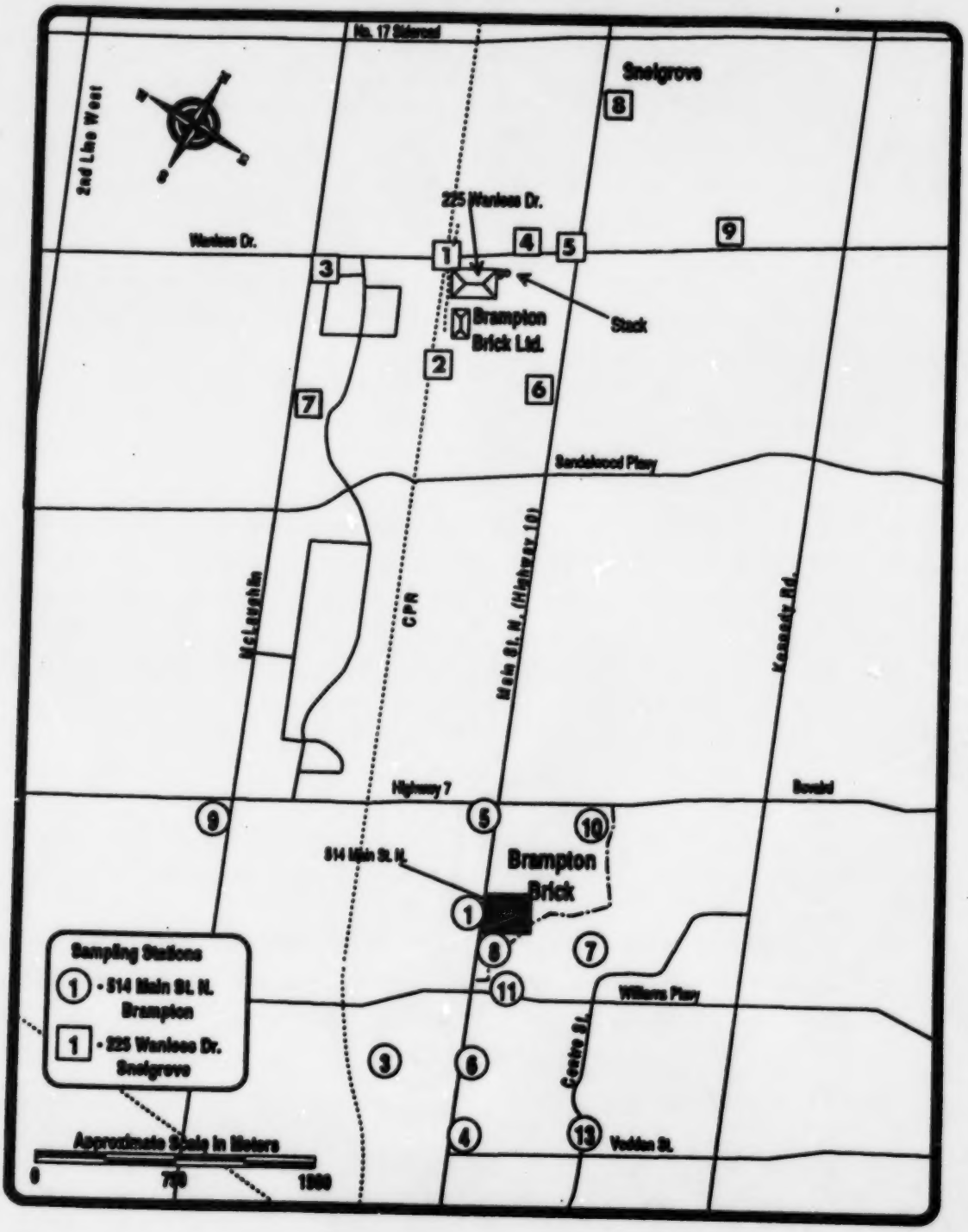
Site No.	Foliage Type	Average Concentration* (ppm, dry wt.) 1986	1987	1989	1990 - Plant Closed -
1	Silver M	105	405	44	6
3	Manitoba M	21	19	12	4
4	Manitoba M	7	9	4	4
5	Manitoba M	12	28	10	4
6	Manitoba M	15	41	18	4
7	Sugar M	25	56	8	2
8	Manitoba M	310	450	150	14
9	White Ash	5	13	5	4
10	Manitoba M	10	17	8	3
11	Manitoba M	195	375	68	4
13	Manitoba M	22	29	10	Re
Urban ULN			35		

* Average of duplicate sample results

M - Maple Re - Tree removed

Note: Results underlined exceed urban ULN, see attached appendix

Sketch Map Showing the Approximate Locations of the Sampling Sites in the Vicinity of the Brampton Brick Ltd. Brickworks at 225 Wanless Dr. and 514 Main St. N, Brampton - 1990



Appendix

Derivation and Significance of the MOE Phytotoxicology "Upper Limits of Normal" Contaminant Guidelines.

The MOE Upper Limits of Normal (ULN) contaminant guidelines represent the expected maximum concentration in surface soil, foliage (trees and shrubs), grass, moss bags, and snow from areas in Ontario not exposed to the influence of a point source of pollution. Urban ULN guidelines are based on samples collected from developed urban centres, whereas rural ULN guidelines were developed from non-urbanized areas. Samples were collected by Phytotoxicology staff using standard sampling procedures (ref: Ontario Ministry of the Environment 1983, *Phytotoxicology Field Investigation Manual*). Chemical analyses were conducted by the MOE Laboratory Services Branch.

The ULN is the arithmetic mean, plus three standard deviations of the mean, of the suitable background data. This represents 99% of the sample population. This means that for every 100 samples which have not been exposed to a point source of pollution, 99 will fall within the ULN.

The ULNs do not represent maximum desirable or allowable limits. Rather, they are an indication that concentrations that exceed the ULN may be the result of contamination from a pollution source. Concentrations that exceed the ULNs are not necessarily toxic to plants, animals, or people. Concentrations that are below the ULNs are not known to be toxic.

ULNs are not available for all elements. This is because some elements have a very large range in the natural environment and the ULN, calculated as the mean plus three standard deviations, would be unrealistically high. Also, for some elements, insufficient background data is available to confidently calculate ULNs. The MOE Phytotoxicology ULNs are constantly being reviewed as the background environmental data base is expanded. This will result in more ULNs being established and may amend existing ULNs.